PROCEEDINGS OF THE

ENTOMOLOGICAL SOCIETY OF WASHINGTON

VOL. 56 AUGUST 1954 NO. 4

TWO NEW FLEAS OF THE GENUS ARAEOPSYLLA JORDAN AND ROTHSCHILD, 1921

(SIPHONAPTERA)

BY ROBERT TRAUB, *Lt. Col., MSC, Department of Entomology, Army Medical Service Graduate School, Washington, D. C.*

During public health research activities in Egypt and Thailand, the U. S. Naval Medical Research Unit No. 3 and the Special Technical and Economic Mission of the Public Health Service, respectively, collected ectoparasites of unusual interest. Among the Siphonaptera sent to the Army Medical Service Graduate School for study were two new species of the genus *Areaopsylla* Jordan and Rothschild, 1921, which are described below.

The genus *Araeopsylla* includes three previously described species of fleas parasitizing bats in widely separated regions of the world. The genotype, *A. scitulus* (Rothschild, 1909), is known only from South Africa. *A. martialis* (Rothschild, 1903) has been reported only from the Island of Réunion, in the Malagasy subregion. *A. gestroi* (Rothschild, 1906) was originally described from Italy, but females from Ceylon have been identified as this species (1).[1]

Included in the present paper are illustrations of pertinent features of *A. gestroi*, made from the male holotype, in the British Museum (Tring) collection, by F. G. A. M. Smit.

Araeopsylla wassifi, new species

Diagnosis.—Near *A. gestroi* (Rothschild, 1906) but separable as follows: Apex of crochet conspicuously beak-shaped, fig. 20, *CR.*,[2] not subtruncate, fig. 3. Apex of manubrium, fig. 15, *MB.*, quite narrow, about seven times as long as broad at midpoint and somewhat inclined ventrad, instead of being broad (about one-third as broad at midpoint as long) and somewhat upturned, fig. 5. Ninth sternum of male with distal arm, fig. 11, apically narrowed and produced into a short snout instead of being broad and subrounded, fig. 6.

Description.—*Head*, fig. 7, *Male*. Frontoclypeal margin evenly curved. The curved row of preantennal bristles below the submarginal anterior

[1]Figures in parentheses refer to entries in the bibliography below.

[2]For explanation of abbreviations, *see* Proc. Ent. Soc. Wash. 54:2, 1952.

and dorsal clear area consisting of about 16 or 17 short bristles, of which the dorsalmost are the longest, especially that bristle bordering antennal groove. Other preantennal bristles as follows: two submedian bristles at level of apex of second antennal segment (when *in situ*); a third bristle in a horizontal line with these two, but alongside antennal groove; with a similar bristle immediately above this, also near groove; ocular bristle, *O.B.*, very long, bordering antennal fossa and inserted above base of genal process. Anterior spine of genal ctenidium apically subtruncate, slightly broader and shorter than second, which is apically more ovate. Maxillary lobe with dorsal margin distinctly concave so that lobe is subapically expanded; distal margin truncate, not extending to apex of third segment of maxillary palpus, *M.P.*, or apex of first segment of labial palpus, *L.P.* First segment of maxillary palpus the longest; nearly twice as long as second segment. Labial palpus four-segmented, not reaching much beyond proximal third of forecoxa. Second antennal segment with a lightly sclerotized flange which is as long as segment proper and which covers proximal four or five segments of club; the bristles of the segment moved distad to apex of flange and with conspicuous pore channels. Postantennal region with four irregular rows of bristles, arranged 3-4-5-6; in addition, with a few irregular, fairly long bristles which, with ventralmost of above rows, form an oblique row bordering antennal fossa, and a group of four subspiniform bristles at ventrocaudal angle; the uppermost of the spiniforms the longest. Dorsal margin of postantennal region heavily sclerotized, the incrassations delimited by bases of dorsal bristles. First vinculum, *VC.-1*, dilated at each end; this link plate received in a very distinct sinus in prosternosome. The tentorial bridge, *T.BR.*, arising midway between first vinculum and uppermost of spiniform bristles at ventrocaudal angle of head.

Thorax.—Pronotum with two rows of bristles and dorsal incrassations similar to those of postantennal region of head. Second vinculum, *VC.-2*, with spiracle inserted at level of base of lowermost spine of pronotal ctenidium. Pronotum with a comb of about 10 spines per side. Mesonotum incrassate in manner suggesting pronotum and other terga; mesonotum with a clump of bristles near anterodorsal angle; with a vestige of three rows represented by but two bristles each, the bristles subdorsal; at times with an additional, submedian bristle, between and ventral to last two rows. Mesonotal flange with three pseudosetae, two of which are subdorsal, the third ventral. Mesopleura pitched or inclined forward in manner characteristic of many bat fleas. Mesepisternum, fig. 13, *MPS.*, with a clump of about 10 or 12 bristles in anterodorsal region; with two submedian bristles immediately below this clump; with the episternal rod, *EP.R.*, of Johnson (*in litt.*) well developed. Mesepimere, *MPM.*, with a dorsal bristle and one submedian bristle; in addition with a ventral row of three or four bristles, that above spiracle long. Metanotum, *MTN.*, with three rows of bristles, the first row consisting of a dorsomarginal bristle and a longer submedian one, the second of three subdorsal or dorsal

bristles and the third of three or four longer ones—this last row displaced somewhat caudad onto heavily sclerotized flange; in addition with one or two dorsomarginal small bristles. Metanotal flange with one or two apical teeth per side. Lateral metanotal area, *L.M.*, well demarcated; long and narrow, about three times as long as broad; with two well-developed submedian bristles, the dorsalmost twice as long as the ventral one. Metepisternum, *MTS.*, with a long bristle in posterodorsal region; squamulum, *SQ.*, small but distinct. Pleural arch completely lacking. Metepimere, *MTM.*, with about seven to nine medium-sized bristles in four rows, two of these caudomarginal and quite stout in relation to length. Spiracle of metepimere broadly ovate.

Legs.—Procoxa with many lateral bristles scattered over length of segment. Mesocoxa and metacoxa with very few lateral bristles, and these marginal or submarginal. Femora with a dorsomarginal row of short stiff bristles. Profemur lacking submedian bristles; with one ventromarginal bristle at base and one such subapical. Mesofemur with two or three submedian bristles; ventral margin with a basal bristle, two or three subbasal thin ones, and two subapical bristles; with one or two subapical lateral bristles. Metafemur essentially similar to mesofemur. Tibiae with some dorsomarginal bristles single, forming a false comb; the comb relatively inconspicuous because these bristles are lightly sclerotized. Paired dorsolateral tibial bristles arising from distinct notches, usually one bristle very long and thin. Pro- and mesotibiae with five such pairs; metatibia with but four. Measurements (in microns) of tibiae and segments of tarsi (petiolate base deleted):

Leg	Tibia	Tarsal Segments				
		I	II	III	IV	V
Pro-	180	61	82	75	56	122
Meso-	258	182	164	108	66	129
Meta-	339	248	182	122	78	136

None of tarsal bristles reaching beyond apex of following segment. Tarsal segments with an ovate mesal sclerotization near apex of segment, this structure usually displaced towards the outer part of the leg. Fifth tarsal segment with four pairs of lateral plantar bristles plus a basal pair displaced mesad.

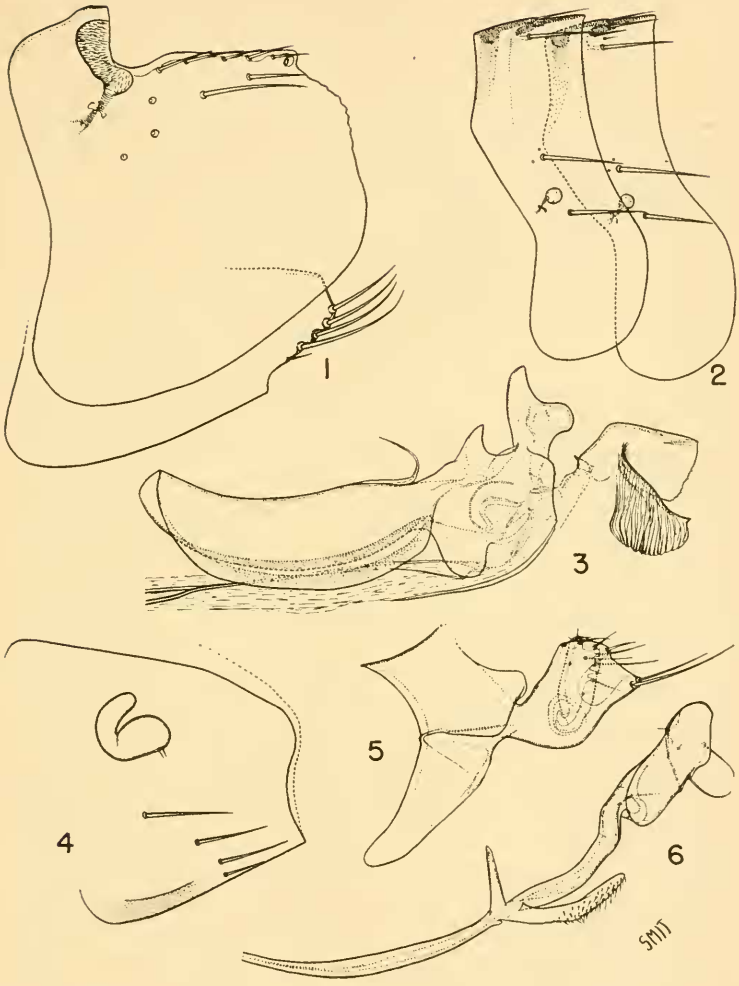
Abdomen.—First tergum with three rows of bristles, the first two reduced to but two or three bristles per side; dorsal incrassation extending ventrad as far as do bristles; flange with one or two apical teeth on each side. Basal sternum with one ventromarginal bristle per side. Dorsal margins of terga two to six deeply incrassate, the heavily sclerotized portion extending ventrad slightly more than halfway to subrounded spiracle. Terga two to six with one row of bristles developed and this reduced, interrupted, the dorsal portion of row consisting of one or two long bristles, the ventral remnant consisting of one long bristle above and another below spiracle; with a small bristle and two lucodiscs dorsad to upper spiracular bristle, the length of the gap between the two groups

of bristles equal to about one and one-half times the length of the spiracular bristle; with a second, anterior, row represented by but one subdorsal bristle. First and second terga in both sexes with one apical spinelet per side. Basal sternum with one marginal bristle per side. Typical sterna in both sexes with two or three marginal or submarginal bristles. With one well-developed antesensilial bristle, figs. 15, 16, *A.B.*, in each sex.

Modified Abdominal Segments, Male, fig. 15.—Eighth tergum enclosing much of genitalia, extending ventrad to level of penis rods and caudad to near apex of aedeagal endchamber; dorsocaudal angle somewhat produced; with five to seven dorsomarginal or subdorsal bristles, and one to three submedian bristles. Eighth spiracle, *8SPC.*, very large, about two and one-half times as long as broad. Eighth sternum, *8S.*, very large, extending dorsad to ventral portion of aedeagus; somewhat narrowed apically and bearing four submarginal bristles. Immovable process of clasper, *P.* and fig. 22, with expanded portion about as long as broad, dorsally convex, evenly rounded except for somewhat flattened or concave portion near dorsocaudal angle; caudal margin fairly straight, ventral margin convex except for proximal portion. Process *P.* with two stout, conspicuous bristles at dorsocaudal angle; with two or three dorsomarginal bristles. Digitoid or movable finger, *F.* and fig. 22, almost three times as long as broad at maxima; anterior and posterior margins fairly straight and parallel except where caudal margin curves to meet subtruncate apical margin; dorsal margin with two small bristles, caudal margin with five or six marginal or submarginal bristles, four or five of which are almost as long as those on *P.* Manubrium, *MB.*, long and narrow, about seven times as long as broad at midpoint; directed ventrad but slightly curved caudad. Apodeme of ninth tergum, *T.AP.9*, extending cephalad as a thumb-like process.

Ninth sternum with proximal arm, *P.A.9*, weakly selerotized, especially apically. Distal arm of ninth sternum, *D.A.9* and fig. 11, well developed, long and narrow but with apical two-thirds inclined dorsad, almost at right angles to basal third; this apical region sinuate and expanded distally, forming a cleaver-shaped lobe, *L.9*, whose ventral margin is subtruncate and apex produced into a slight snout. Distal arm with *L.9*, bearing three caudomarginal bristles as follows: one subapical, and one each at extremities of truncate portion; also with approximately three very small median subapical bristles. *D.A.9* with a conspicuous, elongate, tufted, semimembranous process, *9PR.*, arising near base of distal arm and extending as far apicad as base of crochet.

Aedeagal apodeme very broad, the region cephalad of apodemal strut about three times as long as broad; lateral plate, *L.PT.* and fig. 20, very prominently directed ventrad at base of pouch wall so that endchamber is extremely broad. Median dorsal lobe, *M.D.L.*, distally produced, forming a fairly narrow projection. Crochet, *CR.*, enormous, as in most bat fleas, and with a well-developed peg, *PG.*; its base massive and subquadrate; apical portion produced to form a long, conspicuous talon



Araeopsylla gestroi (Rothschild, 1906), fig. 1, male eighth tergum and eighth sternum; fig. 2, unmodified abdominal terga; fig. 3, aedeagus; fig. 4, seventh sternum and spermatheca; fig. 5, manubrium and processes of clasper; fig. 6, ninth sternum, male.

but with apex somewhat rounded. Ventral (apparently caudal) margin of crochet at times sinuate at midpoint. Selerotized inner tube, *S.I.T.*,

short, squat, subvertical. Armature of inner tube, *A.I.T.*, represented as a dorsal (apparently anterior) apical spur. Lateral sclerotization of inner tube, *L.S.I.*, an acuminate ventral projection. Apodemal strut with its lobes very stout, its dorsal lobe, *D.S.*, convex, its mesal lobe, *M.S.*, proximally broad, apically acuminate. Accessory lateral lobe of aedeagus, *A.L.L.*, broad but acuminate and extending to well-developed crescent sclerite, *C.S.* With a lateral narrow sclerite, *S.P.*, overlying *D.S.* and dorsal margin of *S.I.T.*, suggesting sidepiece of *Polygenis*, 2., and primary and secondary lateral sclerites of *Sternopsylla*, 3. Penis rods, *P.R.*, uncoiled. Ventral intramural rod, *V.I.R.*, well-developed and arising from the inconspicuous vesicle, *V.* Sensilium, *SN.*, very flat. Dorsal lobe of proctiger, *D.A.L.*, somewhat longer than broad, with two groups of bristles arranged 3-2, the apical one slightly longer. Ventral lobe of proctiger conical, with an apical tuft of bristles.

Modified Abdominal Segments, Female, fig. 16. Seventh sternum, *7S.*, with caudal margin slightly concave, with one row of about four or five bristles. Eighth tergum, *8T.*, with a very large spiracle, *8SPC.*; with two long bristles below sensilium and a longer, more median one below these; with about four caudomarginal bristles, two or three submedian bristles merging with a group of three subventral ones; with three short, stout, mesal, submarginal bristles at level of ventral anal lobe. Eighth sternum, *8S.*, quite well developed, more than half as broad as long; without bristles. Anal stylet, *A.S.* and fig. 18, about three times as long as broad, with a very long apical bristle and two rudimentary subapicals. Ventral anal lobe, *V.A.L.* and fig. 19, short; caudal margin concave, and with five marginal bristles, three of which are at ventrocaudal angle; with one submedian bristle. Spermatheca, fig. 17, with tail one and one-half times as long as head and two-thirds as broad; apex of tail slightly concave. Apex of head almost subtruncate. Bursa copulatrix, *B.C.*, very broad, its duct broad and short.

Types.—Holotype male and allotype female *ex Tadarida aegyptiaca*; Egypt: Giza Province, Abu Rawash; coll. H. Hoogstraal, 3 October 1952, for the United States Naval Medical Research Unit No. 3. Paratypes as follows: five males, six females with same data; four females *ibid.*, but *ex Tadarida teniotis*, 18 September 1952; one female *ibid.*, but *ex T. teniotis*, 22 September; one female *ex Taphozous perforatus*; Cairo, 3 October 1952, coll. H. Hoogstraal; one male and two females with same data as holotype, but coll. Kamal Wassif, 20 October 1951. Holotype and allotype in U. S. National Museum. Paratypes in collections of the Chicago Natural History Museum, the British Museum and that of the author.

Comment.—The species is named for one of the collectors, Dr. Kamal Wassif, an Egyptian scientist who has been of great assistance to the Naval Medical Research Unit No. 3 at Cairo.

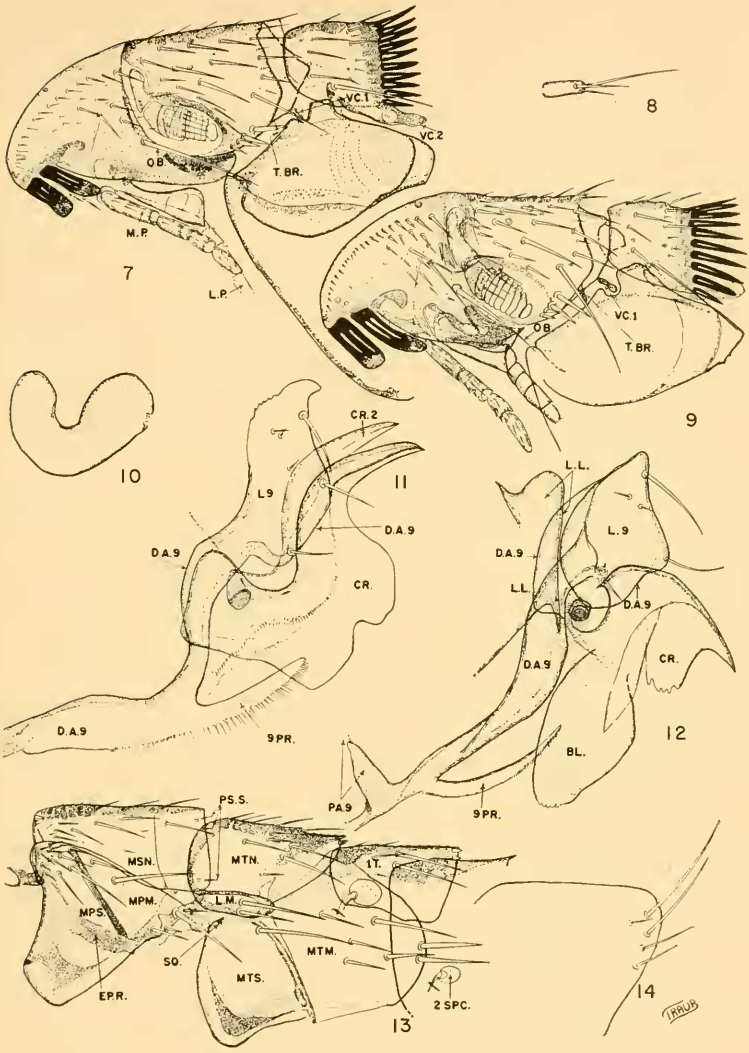


Fig. 7, *Araeopsylla wassifi*, new species, head and prothorax, male; fig. 8, *Aracopsylla elbeli*, new species, anal stylet, female; fig. 9, *ibid.*, head and prothorax, male; fig. 10, *ibid.*, spermatheca; fig. 11, *Arasopsylla wassifi*, distal arm of male ninth sternum and crochet; fig. 12, *Aracopsylla elbeli*, distal arm of male ninth sternum and crochet; fig. 13, *Aracopsylla wassifi*, meso- and metathorax; fig. 14, *Aracopsylla elbeli*, apex, male eighth sternum.

Araeopsylla elbeli, new species

Diagnosis.—Near *A. wassifi*, but immediately separable as follows: Aedeagal crochet, fig. 21, *CR.*, with a huge ventral bladder-like projection, *BL.*, which is absent in *A. wassifi*, fig. 20, *CR.* Distal arm of male ninth sternum, fig. 12, *D.A.9*, apically much broader, i.e., *L.9* is about as broad as long instead of narrowing somewhat to form a snout (*cf.* fig. 11). Process *P.* of clasper, fig. 23, *P.*, caudally produced into a thumb-like projection which is absent in *A. wassifi*, fig. 22, *P.* Female eighth tergum with spiracle relatively much broader, more than half as broad as long instead of merely one-third as broad as long.

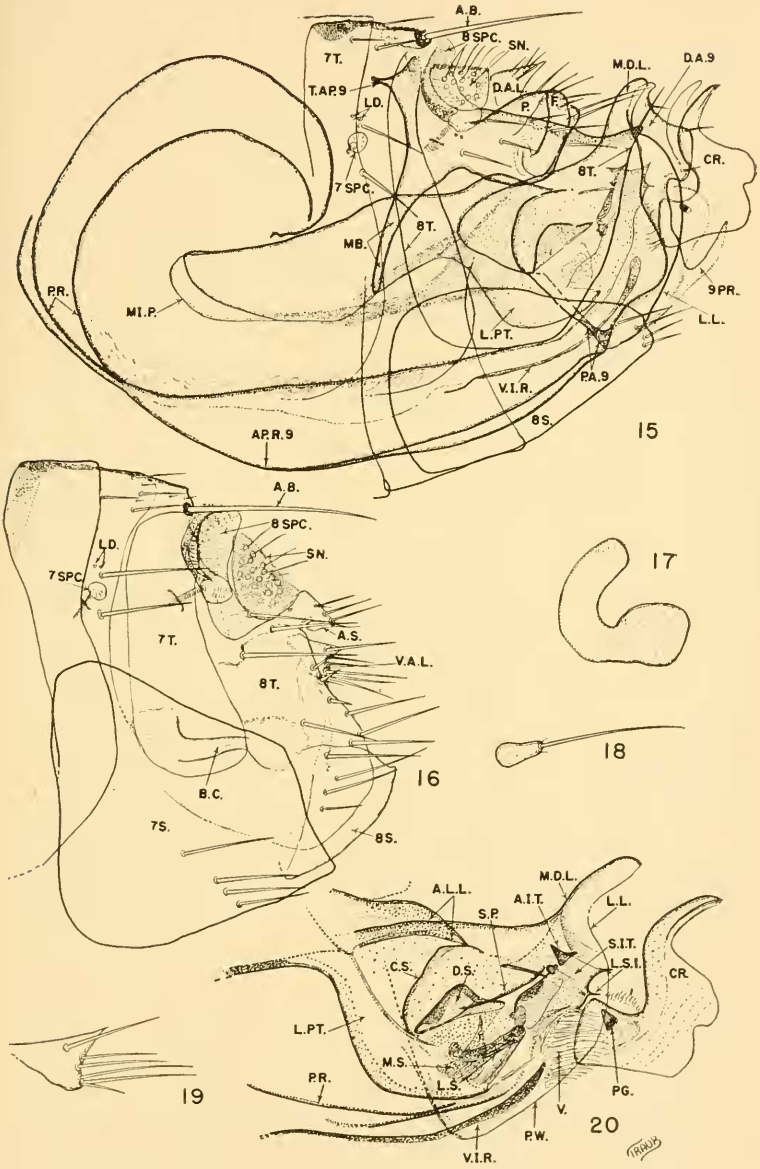
Separable from *A. gestroi* (Rothschild, 1906) as follows: Crochet fig. 21, *CR.*, apically acuminate, not subtruncate, fig. 3; the bladder-like process, *BL.*, apically subovate, not broadly rounded. Male eighth sternum caudally evenly rounded, fig. 14, not excised at insertion of marginal bristles, fig. 1. Manubrium distally downward-directed, not somewhat upturned, fig. 5. Gap between lowest subdorsal bristle of unmodified abdominal terga and that bristle above spiracle definitely smaller, i.e., shorter than length of bristle directly above or below spiracle, whereas in *A. gestroi* the gap is greater than the length of the bristles by spiracle, fig. 2.

Description.—The following description stresses differences from *A. wassifi.*

Head, fig. 9.—with a group of about 15 subdorsal bristles in area between antennal groove and row bordering clear area. Most of these short and stout, but two submedian ones long, nearly as long as the ocular bristle, *O.B.* Maxillary lobe with dorsal margin only slightly concave; apical margin somewhat concave. Maxillary palpus with second segment more than two-thirds length of first. Labial palpus short, not extending beyond apex of maxillary palpus. Antennal flange ensheathing proximal two or three segments of club. Postantennal region with five somewhat irregular rows of bristles, arranged 5-4-4-5-6, the ventralmost of first two rows forming a confused group of four to six short bristles; with a ventral bristle between last two rows; with a group of about four or five subspiniform bristles at apex of antennal groove, the uppermost by far the longest and stoutest.

Thorax and Legs.—Metepimere with four or five bristles arranged 2(3)-2. Metatibia with five pairs of dorsomarginal bristles arising from distinct notches. Measurements (in microns) of tibiae and segments of tarsi (petiolate base deleted):

Leg	Tibia	Tarsal Segments				
		I	II	III	IV	V
Pro-	212	82	101	80	52	113
Meso-	306	212	174	111	71	118
Meta-	418	311	205	124	78	125



Aracopsylla wassifi: Fig. 15, modified abdominal segments, male; fig. 16, female; fig. 17, spermatheca; fig. 18, anal stylet; fig. 19, ventral anal lobe, female; fig. 20, endchamber of aedeagus.

Abdomen.—Unmodified terga with gap between lowest subdorsal bristle and the bristle above spiracle somewhat shorter than length of bristle below spiracle; with a single lucodisc above upper spiracular bristle, the second lucodisc distinctly ventrad to this bristle. Typical sterna in male with one or two ventromarginal or submarginal bristles, three in female.

Modified Abdominal Segments, Male.—Eighth tergum, fig. 25, *8T.*, with seven dorsomarginal or subdorsal bristles; in addition, with a row of three submedian bristles below first dorsomarginal and a horizontal row of four evenly spaced subdorsal bristles, the last near dorsocaudal angle. Eighth sternum, fig. 14, *8S.*, broad; somewhat ovate apically, bearing a submarginal row of four long bristles, and at times with an adjacent small subapical one. Immovable process of clasper, fig. 23, *P.*, dorsally convex, caudally produced into a conspicuous median snout, bearing two long stout bristles; with three or four fairly thin dorsomarginal bristles. Digitoid, *F.*, inserted only slightly below midpoint of process *P.*, about two and one-half times as long as broad at maxima; sides subparallel to apex; distal margin fairly straight; with two fairly stout median bristles and about six caudomarginal bristles. Manubrium about four times as long as broad at midpoint, directed ventrad. Ninth sternum with proximal arm, fig. 21, *P.A.9*, very weakly sclerotized, except for subtriangular basal portion. Distal arm of ninth sternum, fig. 12, *D.A.9*, long and narrow, but apical third expanded to form a subquadrate lobe, *L.9*, about twice as broad as remainder of arm; this lobe apically subtruncate, almost angled; with a subapical, caudomarginal bristle; ventral margin of lobe sinuate, with a fairly long bristle at ventrocaudal angle; with about two subapical or submedian short bristles.

Aedeagus, fig. 21, with crochet, *CR.*, almost twice as long as broad; dorsal margin fairly straight but apically acuminate; ventral margin usually proximally serrate; apex falcate. Crochet with a very conspicuous but lightly sclerotized bladder-like portion, *BL.*, which is as long as remainder of crochet. Lateral lobes, *L.L.*, dorsoapically produced to form a long narrow beak, *cf.* fig. 12. Lateral plate of aedeagus dorsoapically modified to form a well-developed, long dorsoapical spur, *S.L.P.*, and an acuminate accessory lateral lobe, *A.L.L.* Median dorsal lobe, *M.D.L.* paired distally broad.

Modified Abdominal Segments, Female.—Seventh sternum, fig. 24, *7S.*, with caudal margin dorsally rounded, remaining portion concave; with a row of four or five fairly long bristles; if but four, the fifth median and represented by a smaller bristle, as in figure. Anal stylet, fig. 8, about four times as long as broad, its sides mainly parallel; with a long apical bristle and two short subapical ones. Spermatheca, fig. 10, with tail longer than head and almost as broad; upcurved so that it is essentially at right angles to head; dorsal margin somewhat concave; ventral margin fairly straight. Bursa copulatrix, B.C. fig. 24, apically dilated, its duct one-half to two-thirds the diameter of the apex.

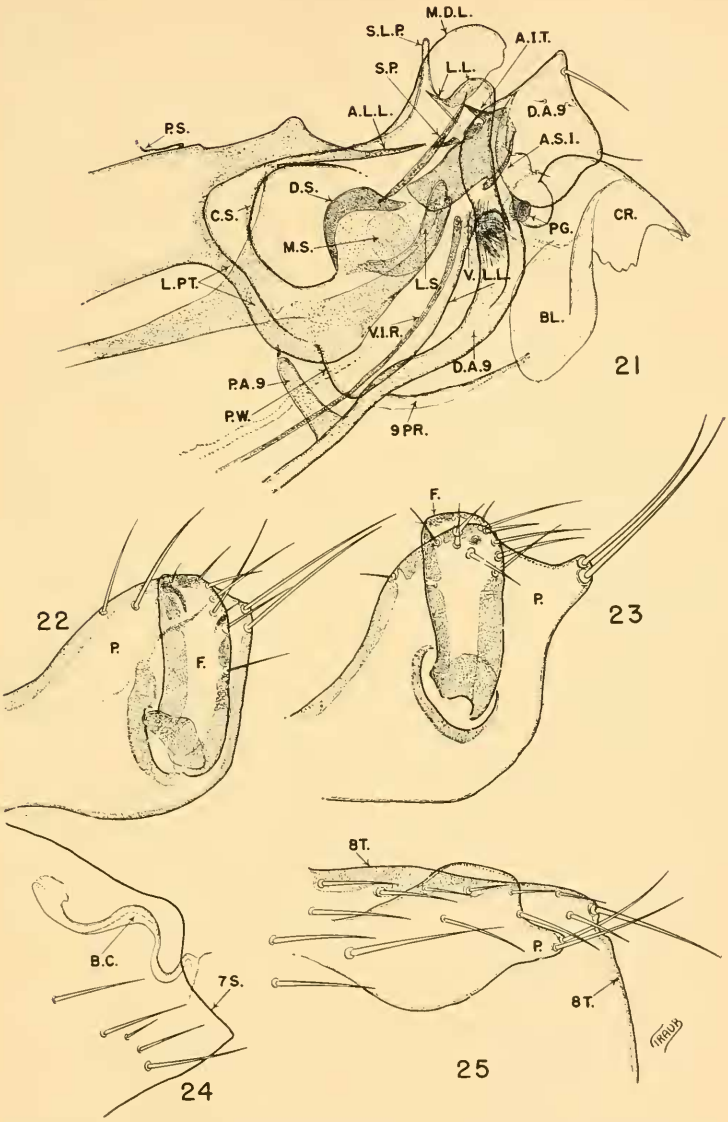


Fig. 21, *Aracopsylla elbeli*, endchamber of aedeagus; fig. 22, *Aracopsylla wassifi*, immovable process and digitoid of clasper; fig. 23, *Aracopsylla elbeli*, immovable process and digitoid of clasper; fig. 24, *Ibid.*, seventh sternum and bursa copulatrix, female; fig. 25, *Ibid.*, eighth tergum, male.

Types.—Holotype male and allotype female *ex Taphozous melanopogon fretensis* Thomas; Thailand: Kanchanaburi, Tamoung Bantum; coll. R. E. Elbel, 5 April 1952. Two partaype males with same data. Holotype deposited in the U. S. National Museum; paratypes in the author's collection.

Comment.—The species is named for the collector, Robert E. Elbel, who, while contributing much towards the improvement of the health of the Thai people, managed to collect quantities of indigenous mites, fleas and chiggers, thus adding greatly to our knowledge of Indo-Malayan ectoparasites.

ACKNOWLEDGMENTS

Thanks are due Mr. Harry Hoogstraal, of the Naval Medical Research Unit No. 3, and to Mr. Robert E. Elbel, of the Special Technical and Economic Mission to Thailand, for having collected and made available for study these fine species of fleas. I am indebted to F. G. A. M. Smit for having made comparisons with *Araeopsylla gestroi*, which is known only from one male and 5 females deposited in the British Museum at Tring, and for having prepared drawings of its critical characters. Miss Phyllis Johnson of the Department of Entomology, Army Medical Service Graduate School, kindly reviewed the manuscript.

REFERENCES

1. Thompson, G. B. 1937. A List of the Siphonaptera Recorded from Ceylon, Together with a Number of New Records. Ann. Mag. Nat. Hist., Series 10, No. 20: 593-599.
2. Traub, R. and Johnson, Phyllis T. 1952. Fleas Collected During a Plague Survey in Venezuela. Bol. Ofic. San. Panamer. 32 (2): 111-135; pls. I-X.
3. Traub, R. 1950. Siphonaptera from Central America and Mexico—A Morphological Study of the Aedeagus, with Descriptions of New Genera and Species, Zool. Mem. Chicago Nat. Hist., Mus. 1 (1): 1-127; pls. 1-54.

A CONSPECTUS OF THE NORTHEASTERN NORTH AMERICAN SPECIES OF GEOPHILUS

(CHILOPODA, GEOPHILOMORPHA, GEOPHILIDAE)

BY R. E. CRABILL, JR., *St. Louis University, St. Louis, Mo.*

The genus *Geophilus* is one of the hallmarks of the Holarctic Chilopoda for in the North Temperate Zones its members are encountered in nearly every environmental situation inhabitable by geophilomorph centipedes. Considered to be